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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,422	10/08/2003	William J. van Ooij	UOC / 171	7421
26875 7590 03/05/2007 WOOD, HERRON & EVANS, LLP 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202			EXAMINER FEELY, MICHAEL J	
			ART UNIT 1712	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		03/05/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/681,422

Applicant(s)

VAN OOIJ ET AL.

Examiner

Michael J. Feely

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-43, 46-55 and 97-100 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 26-43, 46-55 and 97-100 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Pending Claims

Claims 26-43, 46-55, and 97-100 are pending.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 21, 2007 has been entered.

Response to Arguments

2. Applicant's arguments, see pages 12-16 of the response, filed February 21, 2007, with respect to the rejection(s) of claim(s) 26-43, 46-55, and 97-100 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Pines (US Pat. No. 3,088,847).

3. The rejection of claims 26-43, 46-55, and 97-100 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (WO 00/63462) in view of Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.

4. The rejection of claims 26-43, 46-55, and 97-100 under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,416,869) in view of Shimakura et al. (US Pat. No. 6,475,300) has been withdrawn.

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5. The rejection of claims 26-43, 46-55, and 97-100 under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Van Ooij et al. (WO 00/63462) and Shimakura et al. (US Pat. No. 6,475,300), as applied to claims 26-43, 46-55, and 97-100 above, and further in view of Song et al. (US Pat. No. 6,361,592) and Brown et al. (US Pat. No. 6,132,808) has been withdrawn.

6. The rejection of claims 26-43, 46-55, and 97-100 under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Van Ooij et al. (US Pat. No. 6,416,869) and Shimakura et al. (US Pat. No. 6,475,300), as applied to claims 26-43, 46-55, and 97-100 above, and further in view of Song et al. (US Pat. No. 6,361,592) and Brown et al. (US Pat. No. 6,132,808) has been withdrawn.

Claim Rejections - 35 USC § 103

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 26-35, 41-43, 97, and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (WO 00/63462) in view of Pines (US Pat. No. 3,088,847).

Regarding claims 26-35, 42, 43, 97 and 98, Van Ooij et al. disclose: **(26)** a method of bonding *rubber* to a metal substrate (Abstract; page 15, lines 3-25), the method comprising: (a) applying a silane solution comprising a substantially hydrolyzed amino-silane and a substantially hydrolyzed sulfur-containing silane to at least a portion of a surface of a metal substrate (page 10, line 21 through page 18, line 22); (2) drying the silane solution on the metal substrate to form a coating (page 14, lines 3-13); and (3) applying an uncured *rubber* onto the surface of the metal

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substrate having the coating thereon and curing the *rubber* to bond the *rubber* to the coated metal substrate (page 14, line 14 through page 16, line 2);

(27) further comprising, prior to applying the solution: mixing an amino-silane and a sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the amino-silane and the sulfur silane; and mixing the hydrolyzed amino-silane and the hydrolyzed sulfur-containing silane together to form the solution to be applied to the metal substrate (page 11, lines 1-13); (28) wherein the aqueous-based medium comprises water and alcohol (page 11, lines 1-13); (29) wherein the amino-silane is a compound of the general formula (I) *see claim for details* (page 16, line 3 through page 17, line 13); (30) wherein the amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, N-methyl-aminopropyltriethoxysilane, and combinations thereof (page 16, line 3 through page 17, line 13); (31) wherein the sulfur-containing silane is a compound of the general formula (II) *see claim for details* (page 17, line 14 through page 18, line 22); (32) wherein the sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (page 17, line 14 through page 18, line 22);

(33) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (page 13, lines 6-10);

(34) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane of about 1:1 by volume (page 13, lines 6-10);

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(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (page 13, lines 21-28);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (page 24, lines 20-26);

(97) wherein the rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (page 15, lines 3-25); and

(98) wherein the rubber is selected from the group consisting of sulfur-cured rubber, peroxide-cured rubber, and combinations thereof (page 15, lines 3-25).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm .

Pines discloses a similar method, wherein aminoalkyl-alkoxy silanes are applied to a metal substrate as a primer layer. A polymeric material, including rubber, is then applied on top of the primer layer (*see column 1, lines 1-30*). The silane primer layer facilitates superior adhesion of the top layer to the metal, along with improved corrosion resistance of the coated metal (*see column 1, lines 1-30*). With respect to the coating thickness of the silane primer layer, Pines discloses, "The thickness of the underfilm applied is not narrowly critical and may vary from very small thicknesses to relatively large ones. Film thicknesses ranging from 0.01 to 0.10 mil (0.254 μm – 2.54 μm) are preferred although from an economic point of view, small thicknesses, as small as 0.005 mil (0.127 μm), can be employed," (*see column 6, lines 38-43*). These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating thickness of from about 0.1 μm to about 1 μm or from about 0.2 μm to about 0.6 μm , as taught by Pines, in the method of Van Ooij et al., because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein film thicknesses ranging from 0.01 to 0.10 mil (0.254 μm – 2.54 μm) are preferred. These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Regarding claim 41, Van Ooij et al. fail to explicitly disclose: (41) wherein drying comprises heating the silane solution on the metal substrate to a temperature of at least about 60°C.

With respect to drying, Pines disclose, “After dipping or spraying of the aminoalkyl silicon compound on the metal, the coating can be cured by heating to temperatures of from 50-150°C and above or by simply allowing the coated metal to stand. By curing of this “prime coating”, as used in this disclosure, is meant the fixing, bonding, or complexing of the coating to the surface,” (see column 6, lines 12-18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to dry the silane solution on the metal substrate to a temperature of at least about 60°C, as taught by Pines, in the method of Van Ooij et al. because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein the silane is cured by heating to temperatures of from 50-150°C and above, resulting in the fixing, bonding, or complexing of the silane coating to the metal surface.

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9. Claims 36-40, 46-55, 99, and 100 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (WO 00/63462) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300).

Regarding claims 36-40, the combined teachings of Van Ooij et al. and Pines are silent regarding: **(36)** the presence of a nano-size particulate material in the silane solution; **(37)** wherein the nano-size particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof; **(38)** wherein the nano-size particulate material has an average particle size of about 0.1 μm or less; **(39)** wherein the nano-size particulate material is silica in a concentration range from about 10 ppm to about 1% by weight of the solution; and **(40)** wherein the nano-size particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution.

Shimakura et al. also disclose a silane-based intermediate (*primer*) layer for metal substrates (Abstract; column 2, lines 29-32). After the silane-based treatment is applied, a topcoat is applied, wherein the silane-based coating imparts corrosion resistance to the metal substrate. In addition to their silanes, they disclose, "The metallic surface-treatment agent of the present invention comprises water-dispersible silica. The water-dispersible silica which can be used is not particularly restricted...The spherical silica includes colloidal silica such as *Snowtex N*, *Snowtex UP*...The above water-dispersible silica is formulated in a concentration of 0.05 to 100 g/l, preferably 0.5 to 60 g/l...If the concentration of water-dispersible silica is less than 0.05 g/l, the corrosion resistance-improving effect will be insufficient, while the use of silica in excess of 100 g/l will not be rewarded with any further improvement in corrosion resistance but rather detract from bath stability of the metallic surface-treating agent," (*see column 3, lines 19-40*).

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The teachings of Shimakura et al. demonstrate the following: (1) they add nano-size silica having an average particle size of about 0.1 μm or less (*see product sheet for Snowtex products*) to provide an enhanced corrosion resistance property to their silane-based primer; and (2) the concentration of the silica nano-particles is a result effective variable, ensuring desired corrosion-resistance and bath stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide these silica nano-particles in an optimized concentration range (*limitations of claims 39-40*) in the solution used in the combined teachings of Van Ooij et al. and Pines because the teachings of Shimakura et al. demonstrate that this concentration range is a result effective variable, ensuring corrosion-resistance and bath stability.

Regarding claims 46-55, 99, and 100, the combined teachings of Ooij et al., Pines, and Shimakura et al. are as set forth above and incorporated herein to obviously satisfy all of the limitations set forth in claims 46-55, 99, and 100.

10. Claims 26-35, 41-43, 97, and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,416,869) in view of Pines (US Pat. No. 3,088,847).

Regarding claims 26-35, 42, 43, 97 and 98, Van Ooij et al. disclose: (26) a method of bonding *rubber* to a metal substrate (Abstract; column 9, lines 12-41), the method comprising: (a) applying a silane solution comprising a substantially hydrolyzed amino-silane and a substantially hydrolyzed sulfur-containing silane to at least a portion of a surface of a metal substrate (column 6, line 28 through column 11, line 46); (2) drying the silane solution on the

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metal substrate to form a coating (column 8, lines 37-51); and (3) applying an uncured *rubber* onto the surface of the metal substrate having the coating thereon and curing the *rubber* to bond the polymeric material to the coated metal substrate (column 8, line 52 through column 9, line 52);

(27) further comprising, prior to applying the solution: mixing an amino-silane and a sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the amino-silane and the sulfur silane; and mixing the hydrolyzed amino-silane and the hydrolyzed sulfur-containing silane together to form the solution to be applied to the metal substrate (column 6, lines 43-47); (28) wherein the aqueous-based medium comprises water and alcohol (column 6, lines 29-47); (29) wherein the amino-silane is a compound of the general formula (I) *see claim for details* (column 9, line 42 through column 10, line 65); (30) wherein the amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, N-methyl-aminopropyltriethoxysilane, and combinations thereof (column 9, line 42 through column 10, line 65); (31) wherein the sulfur-containing silane is a compound of the general formula (II) *see claim for details* (column 10, line 66 though column 12, line 27); (32) wherein the sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (column 10, line 66 though column 12, line 27);

(33) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (column 7, line 59 through column 8, line 18);

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(34) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane of about 1:1 by volume (column 7, line 59 through column 8, line 18);

(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (column 8, line 19-36);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (column 15, lines 10-18);

(97) wherein the rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (column 9, lines 12-41); and

(98) wherein the rubber is selected from the group consisting of sulfur-cured rubber, peroxide-cured rubber, and combinations thereof (column 9, lines 12-41).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm .

Pines discloses a similar method, wherein aminoalkyl-alkoxy silanes are applied to a metal substrate as a primer layer. A polymeric material, including rubber, is then applied on top of the primer layer (*see column 1, lines 1-30*). The silane primer layer facilitates superior adhesion of the top layer to the metal, along with improved corrosion resistance of the coated metal (*see column 1, lines 1-30*). With respect to the coating thickness of the silane primer layer, Pines discloses, "The thickness of the underfilm applied is not narrowly critical and may vary from very small thicknesses to relatively large ones. Film thicknesses ranging from 0.01 to 0.10 mil (0.254 μm – 2.54 μm) are preferred although from an economic point of view, small

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thicknesses, as small as 0.005 mil ($0.127\ \mu\text{m}$), can be employed,” (see column 6, lines 38-43).

These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating thickness of from about $0.1\ \mu\text{m}$ to about $1\ \mu\text{m}$ or from about $0.2\ \mu\text{m}$ to about $0.6\ \mu\text{m}$, as taught by Pines, in the method of Van Ooij et al., because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein film thicknesses ranging from 0.01 to 0.10 mil ($0.254\ \mu\text{m} - 2.54\ \mu\text{m}$) are preferred. These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Regarding claim 41, Van Ooij et al. fail to explicitly disclose: (41) wherein drying comprises heating the silane solution on the metal substrate to a temperature of at least about 60°C .

With respect to drying, Pines disclose, “After dipping or spraying of the aminoalkyl silicon compound on the metal, the coating can be cured by heating to temperatures of from $50-150^{\circ}\text{C}$ and above or by simply allowing the coated metal to stand. By curing of this “prime coating”, as used in this disclosure, is meant the fixing, bonding, or complexing of the coating to the surface,” (see column 6, lines 12-18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to dry the silane solution on the metal substrate to a temperature of at least about 60°C , as taught by Pines, in the method of Van Ooij et al. because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein the silane is cured by heating to temperatures of from $50-150^{\circ}\text{C}$ and above, resulting in the fixing, bonding, or complexing of the silane coating to the metal surface.

11. Claims 36-40, 46-55, 99, and 100 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,416,869) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300).

Regarding claims 36-40, the combined teachings of Van Ooij et al. and Pines are silent regarding: (36) the presence of a nano-size particulate material in the silane solution; (37) wherein the nano-size particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof; (38) wherein the nano-size particulate material has an average particle size of about 0.1 μm or less; (39) wherein the nano-size particulate material is silica in a concentration range from about 10 ppm to about 1% by weight of the solution; and (40) wherein the nano-size particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution.

Shimakura et al. also disclose a silane-based intermediate (*primer*) layer for metal substrates (Abstract; column 2, lines 29-32). After the silane-based treatment is applied, a topcoat is applied, wherein the silane-based coating imparts corrosion resistance to the metal substrate. In addition to their silanes, they disclose, "The metallic surface-treatment agent of the present invention comprises water-dispersible silica. The water-dispersible silica which can be used is not particularly restricted...The spherical silica includes colloidal silica such as *Snowtex N*, *Snowtex UP*...The above water-dispersible silica is formulated in a concentration of 0.05 to 100 g/l, preferably 0.5 to 60 g/l...If the concentration of water-dispersible silica is less than 0.05 g/l, the corrosion resistance-improving effect will be insufficient, while the use of silica in excess

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of 100 g/l will not be rewarded with any further improvement in corrosion resistance but rather detract from bath stability of the metallic surface-treating agent,” (see column 3, lines 19-40).

The teachings of Shimakura et al. demonstrate the following: (1) they add nano-size silica having an average particle size of about 0.1 μm or less (see product sheet for Snowtex products) to provide an enhanced corrosion resistance property to their silane-based primer; and (2) the concentration of the silica nano-particles is a result effective variable, ensuring desired corrosion-resistance and bath stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide these silica nano-particles in an optimized concentration range (limitations of claims 39-40) in the solution used in the combined teachings of Van Ooij et al. and Pines because the teachings of Shimakura et al. demonstrate that this concentration range is a result effective variable, ensuring corrosion-resistance and bath stability.

Regarding claims 46-55, 99, and 100, the combined teachings of Ooij et al., Pines, and Shimakura et al. are as set forth above and incorporated herein to obviously satisfy all of the limitations set forth in claims 46-55, 99, and 100.

12. Claims 26-35, 41-43, 97, and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Ooij et al. (US Pat. No. 6,756,079) in view of Pines (US Pat. No. 3,088,847).

Regarding claims 26-35, 42, 43, 97 and 98, Van Ooij et al. disclose: (26) a method of bonding rubber to a metal substrate (Abstract; column 9, lines 21-50; claims 7-19, 24-31 & 33), the method comprising: (a) applying a silane solution comprising a substantially hydrolyzed

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amino-silane and a substantially hydrolyzed sulfur-containing silane to at least a portion of a surface of a metal substrate (column 6, line 39 through column 11, line 50; *claims 7-19, 24-31 & 33*); (2) drying the silane solution on the metal substrate to form a coating (column 8, lines 46-60; *claims 7-19, 24-31 & 33*); and (3) applying an uncured *rubber* onto the surface of the metal substrate having the coating thereon and curing the *rubber* to bond the polymeric material to the coated metal substrate (column 8, line 61 through column 9, line 61; *claims 7-19, 24-31 & 33*);

(27) further comprising, prior to applying the solution: mixing an amino-silane and a sulfur-containing silane separately with an aqueous-based medium to substantially hydrolyze the amino-silane and the sulfur silane; and mixing the hydrolyzed amino-silane and the hydrolyzed sulfur-containing silane together to form the solution to be applied to the metal substrate (column 6, lines 54-58; *claims 7-19, 24-31 & 33*); (28) wherein the aqueous-based medium comprises water and alcohol (column 6, lines 40-58; *claims 7-19, 24-31 & 33*); (29) wherein the amino-silane is a compound of the general formula (I) *see claim for details* (column 9, line 51 through column 11, line 8; *claims 7-19, 24-31 & 33*); (30) wherein the amino silane is selected from the group consisting bis(trimethoxysilylpropyl)ethylene diamine, bis(trimethoxysilylpropyl) amine, N-methyl-aminopropyltriethoxysilane, and combinations thereof (column 9, line 51 through column 11, line 8; *claims 7-19, 24-31 & 33*); (31) wherein the sulfur-containing silane is a compound of the general formula (II) *see claim for details* (column 11, line 9 though column 12, line 29; *claims 7-19, 24-31 & 33*); (32) wherein the sulfur-containing silane is selected from the group consisting of bis(trimethoxysilylpropyl) disulfide, bis(trimethoxysilylpropyl) tetrasulfide, and combinations thereof (column 11, line 9 though column 12, line 29; *claims 7-19, 24-31 & 33*);

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(33) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane in a range from about 1:4 to about 4:1 by volume (column 8, lines 1-27; *claims 7-19, 24-31 & 33*);

(34) wherein the solution comprises a ratio of the hydrolyzed amino-silane to the hydrolyzed sulfur-containing silane of about 1:1 by volume (column 8, lines 1-27; *claims 7-19, 24-31 & 33*);

(35) wherein applying the solution to the metal substrate comprises dipping the metal substrate in the solution (column 8, line 28-45; *claims 7-19, 24-31 & 33*);

(43) wherein curing comprises applying heat and pressure to the *rubber* and coated metal substrate to form a bond there between (column 15, lines 11-19; *claims 7-19, 24-31 & 33*);

(97) wherein the rubber is selected from the group consisting of natural rubber, synthetic rubber, and combinations thereof (column 9, lines 21-50; *claims 7-19, 24-31 & 33*); and

(98) wherein the rubber is selected from the group consisting of sulfur-cured rubber, peroxide-cured rubber, and combinations thereof (column 9, lines 21-50; *claims 7-19, 24-31 & 33*).

Van Ooij et al. fail to explicitly disclose: (26) a coating thickness in the range from about 0.1 μm to about 1 μm ; and (42) a coating thickness in the range from about 0.2 μm to about 0.6 μm .

Pines discloses a similar method, wherein aminoalkyl-alkoxy silanes are applied to a metal substrate as a primer layer. A polymeric material, including rubber, is then applied on top of the primer layer (*see column 1, lines 1-30*). The silane primer layer facilitates superior adhesion of the top layer to the metal, along with improved corrosion resistance of the coated

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metal (*see column 1, lines 1-30*). With respect to the coating thickness of the silane primer layer, Pines discloses, “The thickness of the underfilm applied is not narrowly critical and may vary from very small thicknesses to relatively large ones. Film thicknesses ranging from 0.01 to 0.10 mil ($0.254\ \mu\text{m}$ – $2.54\ \mu\text{m}$) are preferred although from an economic point of view, small thicknesses, as small as 0.005 mil ($0.127\ \mu\text{m}$), can be employed,” (*see column 6, lines 38-43*). These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating thickness of from about $0.1\ \mu\text{m}$ to about $1\ \mu\text{m}$ or from about $0.2\ \mu\text{m}$ to about $0.6\ \mu\text{m}$, as taught by Pines, in the method of Van Ooij et al., because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein film thicknesses ranging from 0.01 to 0.10 mil ($0.254\ \mu\text{m}$ – $2.54\ \mu\text{m}$) are preferred. These preferred coating thicknesses overlap with both of the instantly claimed ranges.

Regarding claim 41, Van Ooij et al. fail to explicitly disclose: (41) wherein drying comprises heating the silane solution on the metal substrate to a temperature of at least about 60°C .

With respect to drying, Pines disclose, “After dipping or spraying of the aminoalkyl silicon compound on the metal, the coating can be cured by heating to temperatures of from 50 - 150°C and above or by simply allowing the coated metal to stand. By curing of this “prime coating”, as used in this disclosure, is meant the fixing, bonding, or complexing of the coating to the surface,” (*see column 6, lines 12-18*).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to dry the silane solution on the metal substrate to a temperature of at least about 60°C ,

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as taught by Pines, in the method of Van Ooij et al. because Pines discloses a similar method of using an aminoalkyl-alkoxy silanes to bond rubber to metal, wherein the silane is cured by heating to temperatures of from 50-150°C and above, resulting in the fixing, bonding, or complexing of the silane coating to the metal surface.

13. Claims 36-40, 46-55, 99, and 100 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of Van Ooij et al. (US Pat. No. 6,756,079) and Pines (US Pat. No. 3,088,847) in view of Shimakura et al. (US Pat. No. 6,475,300).

Regarding claims 36-40, the combined teachings of Van Ooij et al. and Pines are silent regarding: **(36)** the presence of a nano-size particulate material in the silane solution; **(37)** wherein the nano-size particulate material is selected from the group consisting of silica, zinc oxide, and combinations thereof; **(38)** wherein the nano-size particulate material has an average particle size of about 0.1 μm or less; **(39)** wherein the nano-size particulate material is silica in a concentration range from about 10 ppm to about 1% by weight of the solution; and **(40)** wherein the nano-size particulate material is silica and in a concentration range from about 50 ppm to about 1000 ppm of the solution.

Shimakura et al. also disclose a silane-based intermediate (*primer*) layer for metal substrates (Abstract; column 2, lines 29-32). After the silane-based treatment is applied, a topcoat is applied, wherein the silane-based coating imparts corrosion resistance to the metal substrate. In addition to their silanes, they disclose, "The metallic surface-treatment agent of the present invention comprises water-dispersible silica. The water-dispersible silica which can be used is not particularly restricted...The spherical silica includes colloidal silica such as *Snowtex*

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N, Snowtex UP...The above water-dispersible silica is formulated in a concentration of 0.05 to 100 g/l, preferably 0.5 to 60 g/l...If the concentration of water-dispersible silica is less than 0.05 g/l, the corrosion resistance-improving effect will be insufficient, while the use of silica in excess of 100 g/l will not be rewarded with any further improvement in corrosion resistance but rather detract from bath stability of the metallic surface-treating agent," (*see column 3, lines 19-40*).

The teachings of Shimakura et al. demonstrate the following: (1) they add nano-size silica having an average particle size of about 0.1 μm or less (*see product sheet for Snowtex products*) to provide an enhanced corrosion resistance property to their silane-based primer; and (2) the concentration of the silica nano-particles is a result effective variable, ensuring desired corrosion-resistance and bath stability.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide these silica nano-particles in an optimized concentration range (*limitations of claims 39-40*) in the solution used in the combined teachings of Van Ooij et al. and Pines because the teachings of Shimakura et al. demonstrate that this concentration range is a result effective variable, ensuring corrosion-resistance and bath stability.

Regarding claims 46-55, 99, and 100, the combined teachings of Ooij et al., Pines, and Shimakura et al. are as set forth above and incorporated herein to obviously satisfy all of the limitations set forth in claims 46-55, 99, and 100.

Double Patenting

14. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

15. Claims 26-35, 41-43, 97, and 98 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,076 in view of Pines (US Pat. No 3,088,847).

16. Claims 36-40, 46-55, 99, and 100 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the combined limitations of claims 7-19, 24-31 & 33 of U.S. Patent No. 6,756,076 in view of Pines (US Pat. No 3,088,847) and Shimakura et al. (US Pat. No. 6,475,300).

The obviousness rejection over Van Ooij et al. in view of Pines is as set forth above in section 12 and incorporated herein. The obviousness rejection over Van Ooij et al. in view of Pines and Shimakura et al. is as set forth above in section 13 and incorporated herein.

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The patented claims are deficient in that they do not disclose the following: (a) the mixing sequence of instant claims 27 & 46; (b) the thickness limitations of instant claims 26, 42, 46 & 55; (c) the dipping technique of instant claim 35; (d) the nano-particle limitations of instant claims 36-40, 46 & 52-54; (e) the temperature limitation of instant claims 41; and (f) the heat & pressure limitations of instant claim 43.

With respect to (a), this mixing sequence would have been clearly envisaged by the skilled artisan in light of the specification (*see column 6, lines 54-58*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).

With respect to (b), the thickness limitations would have been obvious in view of Pines for the reasons set forth above in section 12.

With respect to (c), the dipping technique would have been clearly envisaged by the skilled artisan in light of the specification (*see column 8, lines 28-45*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).

With respect to (d), the nano-particle limitations would have been obvious in view of Pines and Shimakura et al. for the reasons set forth above in section 13.

With respect to (e), the temperature limitation would have been obvious in view of Pines for the reasons set forth above in section 12.

With respect to (f), the heat & pressure limitations would have been clearly envisaged by the skilled artisan in light of the specification (*see column 15, lines 11-27*) – see MPEP 804 II. B. 1. & *In re Vogel*, 422 F.2d 438, 441-42, 164 USPQ 619, 622 (CCPA 1970).


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Communication

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Feely whose telephone number is 571-272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Michael J. Feely
Primary Examiner
Art Unit 1712

March 1, 2007

**MICHAEL FEELY
PRIMARY EXAMINER**